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FOREST SERVICE, NORTHERN REGION
FACT SHEET

THE WHITE PINE BLISTER RUST CONTROL PROGRAM

White pine blister rust represents a billion dollar menace to the western white pine lumber economy of northern Idaho, western Montana, and eastern Washington. Logging is well advanced in the extensive western white pine stands of the Inland Empire and new stands are being established. Many stands established shortly after the extensive fires in the early 1900's are nearing merchantable size.

Western white pine is the most valuable and rapid growing tree species in the Inland Empire.

At the present time there are 1,817,000 acres in Region 1 which are considered satisfactorily stocked to western white pine. Some 1,253,000 acres are National Forest; 19,000 acres are Public Domain; and 545,000 acres are state and private lands. The estimated white pine yield from these areas is 500 million board feet annually. In addition, the National Park Service is protecting some 102,000 acres of nearly pure limber, white bark, and western white pine stands for their high esthetic and watershed values.

White pine blister rust is an introduced fungus disease that attacks and destroys white (5 needle) pines. The rust was inadvertently brought into the United States first on the east coast in 1898 and later on the west coast at Vancouver, B.C., in 1910. This virulent disease is now well established throughout the commercial range of western white pine. Blister rust needs two alternate hosts to survive. A part of its life cycle is spent on white pine trees and part on the alternate hosts, currant and gooseberry plants, commonly called ribes. On ribes the rust is a relatively harmless annual; on pines it is a killing perennial.

Although blister rust may spread hundreds of miles from pines to ribes, its spread from ribes to pines is usually not more than 1,000 feet which makes it possible to effect control.

Experimental control work was started under the direction of the Bureau of Plant Industry at the Priest River Experiment Station in 1923 with 10 men and was continued through the next 4 years with larger crews on the Kaniksu and Coeur d'Alene National Forests. Cooperative control work on a project basis was started on the Priest Lake Timber Protective Association in 1928

and on the Clearwater and Potlatch Timber Protective Associations in 1929. First appropriations for control work on National Forest lands were made in fiscal year 1931 and work began on the Clearwater National Forest in late 1930. By 1932 control operations had also been started on the St. Joe, Coeur d'Alene, Kaniksu, Cabinet, and somewhat later on the Kootenai.

The Forest Service is now responsible for the leadership and technical direction of all blister rust control programs in this Region.

White pine blister rust has been controlled in large timber tracts by destroying the ribes growing in white pine stands and in surrounding protective zones about 1,000 feet wide. To accomplish this type of control ribes must be eradicated to rigid standards applied uniformly over extensive areas. Control through ribes eradication is generally impractical for the small isolated woodlot owner.

Where ribes are numerous they are destroyed by chemical herbicide solutions usually applied with power sprayers. Where ribes are sparse and widely scattered hand eradication methods are used. Workers search designated areas guided by string lines which form orderly work lanes to assure systematic coverage. Ribes eradication is limited to stands under 10 years of age.

White pine trees are killed as a result of girdling action by the fungus, which cuts off the supply of plant foods. In the spring orange masses of spores emerging from the blisters are quite frequently clearly evident. Very young trees are killed within 3 or 4 years. Large mature trees are not killed nearly so quickly and may survive 30 years or more after initial infection.

The application of antibiotics to control a forest tree disease is a new innovation in forestry. The blister rust control organization in this Region pioneered the use of systemic antibiotics for the control of white pine blister rust.

With the discovery and development of antifungal antibiotics, it is now possible and practical to save established white pine from blister rust by periodic application of antibiotics and without eradicating ribes.

Since 1949 many fungicides have been investigated. Sixty-six compounds have been subjected to foliar spray screening tests. Two antibiotics, cycloheximide and Phytoactin, derived by fermentation from species of Streptomyces, were found to kill blister rust infections on western white pine. Comprehensive continuing studies are being conducted to advance the use and effectiveness of antibiotics in blister rust control. Eight full-time scientists are employed in this Region.

Acti-dione BR is the registered brand name of cycloheximide manufactured by The Upjohn Company, Kalamazoo, Michigan. Originally derived from Streptomyces griseus it now can be synthesized.

Phytoactin is derived by fermentation from Streptomyces hygroscopicus and produced by the Pabst Laboratories, Milwaukee, Wisconsin.

The period of blister rust infection immunity that will result from a single application of an antibiotic is not known. New infection has not been detected on any western white pine over 10 years of age properly treated with antibiotics in Region 1.

Rather large-scale hand treating was started in 1958. Aerial spraying was started on a project basis in 1960. To date some 130,000 acres have been hand treated and 200,000 acres aerially sprayed with antibiotics.

Phytoactin is the only antibiotic applied aerially. Because of the precise application requirements only helicopters are used for aerial spraying. Fixed-wing aircraft have been tried experimentally and found not fully satisfactory. Helicopters similar or equal to the Hiller Model 12E, Bell G-3, G-3B, or G-3B-1 are used. These carry 60 to 90 gallons of spray solution per trip and spray 60 to 80 acres of white pine per hour. Temporary landing spots and bases of operation are constructed within or adjacent to the spray areas. Aerial spraying is done only during May, June, September, and early October and when temperatures are below 68° Fahrenheit and winds are less than 5 miles per hour. Most of the spraying is done in the early morning hours shortly after daybreak.

Both Acti-dione BR and a special formulation of Phytoactin are used in hand treating which is done with 4-gallon garden-type pressure sprayers mounted on packboards. These units when full weigh about 45 pounds and are backpacked by workers who treat white pine in individual areas designated by string lines similar to methods used in searching for ribes. All salvable white pine crop trees are treated by applying the spray solution to the point of runoff on all sides of the lower one-third or 6 feet of the stems. In addition, the perimeter of all cankers within reach of the ground are scarified with a blade which is attached to the spray wand. This produces a series of small slits about 2 to 3 inches apart around the canker margin. Trees that have cankers which have girdled more than one-half of the circumference are not considered salvable. Hand treatment is done only during the summer months and when the tree boles are dry.

Only 7.5 grams or about one-fourth ounce of the basic antibiotic material is applied per acre. This is formulated in 7 to 10 gallons of carrier in order to obtain adequate coverage. The small amount of antibiotic applied emphasizes the importance of proper formulating, mixing, and application of final spray solutions under exacting conditions.

No harmful side effects of any kind to animals, fish, birds, wildlife, or beneficial fungi have associated with the large-scale field application of antibiotics.

Antibiotic developments are resulting in continuous fundamental changes in blister rust control methods, policies, program planning and control area

concept. An important and complex transition from blister rust control by ribes eradication to control by application of antibiotics is being made.

To date the treatment of nursery stock and trees under 10 years of age designed to provide immunization against the rust has not been fully successful. Ribes eradication is still the only positive method of blister rust control in these very young stands.

Mature white pine over 100 years of age are not treated at present. Antibiotic testing on this older age class is continuing. When treatment methods are perfected some 400,000 acres of damaged mature stands may be treated.

Over 400 western white pines have been found which appear to be resistant to blister rust. The long-range program for breeding blister rust resistant pine was started in 1949 and has now progressed to the point of establishing seed orchards. Seed produced from these orchards will be used for nursery production of planting stock which will average better than 50 percent survival under severe rust conditions in the field. Rust resistant planting stock should be available in sizeable quantities by 1985.

The advantages of antibiotic control of white pine blister rust over control through ribes eradication are:

1. Antibiotic control in general is less than one-half as expensive as control through ribes eradication. The direct cost of a single antibiotic treatment when applied by hand methods is $20 to $25 per acre; by helicopter it is $10 to $12 per acre. However, retreatment with antibiotics will be required in young stands.

2. Antibiotic control is more effective and positive. Final white pine yield per acre can be greatly increased as most blister rust infected trees that are less than one-half girdled can now be saved. Before the use of antibiotics was developed, little or nothing could be done to save infected trees. Some white pine stands not protected through ribes eradication are 65 to 90 percent lethally infected. These stands can now be brought back into the control program. Within blister rust control units where ribes eradication has been done, 25 to 45 percent lethal infection is common in stands established prior to 1940.

3. It is estimated that 40-year-old pole stands in medium to low rust hazard areas will require only two or three antibiotic treatments to reach maturity. How often retreatment is required will depend mainly on the effectiveness of the first treatment, the period of blister rust immunity that will result from a single antibiotic application, the size of the pines, and the local rust hazard. Most reproduction and pole stands of western white pine in this Region, occurring on high rust hazard areas where no ribes eradication was done, have already been lost to the rust. Thus, remaining salvable stands are mainly limited to medium and low rust hazard areas.

4. Antibiotic control has the potentiality of successfully protecting any established white pine stand regardless of size or location. Thus, it affords the opportunity for the private land manager to protect his own individual stand. The land ownership problem from the control standpoint is greatly minimized. Small groups of white pine of high esthetic or recreational value and ornamental plants can be protected from the rust.

Slightly over $2 million including $102,000 contributed by state and private cooperators are spent annually by all agencies in this Region for white pine blister rust control. State and private funds are matched dollar for dollar with Federal funds and the control work is done on selected state and private lands by the Forest Service.

About 500 seasonal employees are employed each year, one-half of whom apply antibiotics with the rest engaged in ribes eradication. Each year in this Region some 100,000 acres are aerially sprayed with antibiotics; 10,000 acres treated by hand with antibiotics; and 10,000 acres freed of ribes.

The immediate objectives in Region 1 are: (1) to provide adequate disease protection to enable the establishment of new western white pine on the better sites following harvest cuts and rehabilitation of presently non-stocked areas, and (2) to treat with antibiotics all immature stands of western white pine over 10 years of age that, on the basis of long-range economic criteria, show a favorable cost-benefit ratio.

The initial application of antibiotics in presently established stands over 10 years of age should be completed by 1970.

The ultimate objective is to do all needed blister rust control through the use of antibiotics and applied forest genetics without ribes eradication. This transition is to be made as rapidly as warranted by sound research and developmental programs. Many important questions remain unanswered.